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BIOLOGICAL EVALUATION OF SOUTHERN PINE BEETLE ON THE LITTLE LAKE CREEK RARE II PROPOSED WILDERNESS AREA AND THE FOUR NOTCH FURTHER STUDY AREA ON THE SAM HOUSTON NATIONAL FOREST

Texan

by

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Abstract

A biological evaluation of southern pine beetle (SPB) infestations was conducted on the Little Lake Creek RARE II Proposed Wilderness Area and Four Notch Further Study Area on the Sam Houston National Forest. The Little Lake Creek Area contained only one large Ips engraver beetle infestation, and Forest Pest Management (FPM) recommends that no action be taken at this time. The Four Notch Area, containing 4,650 acres of susceptible host type, had an estimated 12 active SPB spots, or 3.9 SPB spots/M acres of susceptible host type. FPM recommends that the actively expanding spots be controlled and that a SPB suppression project be initiated on the Four Notch Further Study Area.

INTRODUCTION

A biological evaluation was conducted on the Little Lake Creek RARE II Proposed Wilderness Area and the Four Notch Further Study Area on the Sam Houston National Forest to determine the status of the southern pine beetle (Dendroctonus frontalis Zimm.) populations within the designated areas. Entomologists from State & Private Forestry, Forest Pest Management (FPM), Alexandria, LA, Field Office conducted the evaluation on August 23-25, 1982.

The Little Lake Creek and Four Notch Areas are located on the Raven Ranger District (RD) south of Huntsville, Texas (figure 1). They consist of 2,700 and 5,605 acres, respectively, of mature loblolly and shortleaf sawtimber. The major recreational uses are hiking (along the Lone Star Trail) and hunting.

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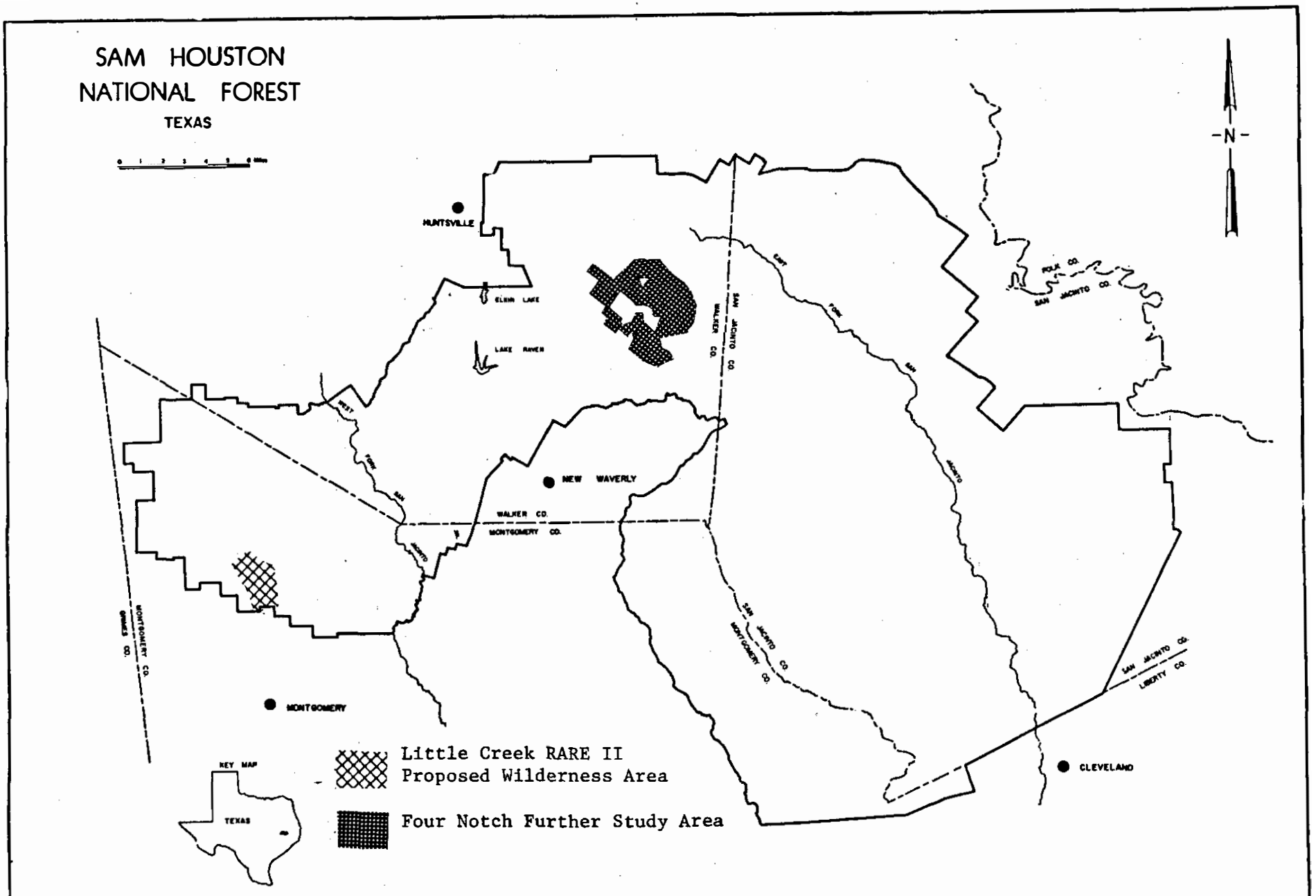

Figure 1. Location of the Proposed Wilderness Areas on the Sam Houston National Forest.

Southern pine beetle (SPB) infestations have been occurring on the National Forests in Texas since the early 1960's. Subsequently populations have fluctuated between endemic and epidemic levels on various districts. The last major peak in SPB activity on the Raven RD occurred in 1976 and carried over into 1977 (Overgaard 1976). In 1980 there was an increase in the number of SPB infestations on the Four Notch Further Study Area and a biological evaluation was conducted (Smith 1980). However, due to hot, dry weather conditions the spots went inactive later that year and SPB populations have remained endemic since that time.

METHOD OF EVALUATION AND ANALYSIS OF SPB INFESTATION

Aerial Survey and Ground Checks

Standard aerial sketch map procedures were used for this evaluation, except survey coverage was 100 percent. The aerial survey was conducted by district personnel, and multiple tree spots of red and/or fading trees were recorded and plotted on Forest Service Class A maps. Nine spots were randomly selected for ground checking.

Numbers of vacated and infested trees, basal area, age, height, percentage of the stand in sawtimber, and landform were recorded. This information was used to run the benefit/cost analysis and to hazard rate the stands.

Hazard Rating

All the SPB infested stands were hazard rated at the time of ground checking. This is part of FPM's effort to validate SPB hazard rating systems whenever the opportunity exists. The system used was developed on the Kisatchie National Forest by Dr. Peter Lorio of the Southern Forest Experiment Station. It is designed for use by the National Forests in Region 8 and utilizes field data collected by the prescriptionist during the field procedure (FSH 2409.21d R8 Kisatchie National Forest Supplement No. 7). Due to the similar nature of the forest conditions between central Louisiana and east Texas, we feel that this hazard rating system should accurately reflect host/site/stand characteristics associated with SPB attack on the Raven RD (Lorio and Sommers 1981).

Suppression Project Criteria

Decisions to initiate SPB suppression projects are based on the following criteria:

- Number of SPB spots per 1,000 acres of susceptible host type

  This figure provides an indication of current levels of SPB activity. Historically, one multiple tree spot/1,000 acres of susceptible host type has been considered the lower threshold of a SPB epidemic. However, one or more spots/1,000 acres of susceptible host type do not always require that a SPB suppression project be undertaken. Projects are not recommended when the

majority of the spots are small, involving minimal timber losses, and individual spots are likely to go inactive.

To determine the number of acres of susceptible host type, the Continuous Inventory of Stand Conditions (CISC) data for the Sam Houston National Forest were accessed and number of acres of loblolly-hardwood, loblolly, shortleaf, and bottomland hardwood-yellow pine were determined (forest type codes 13, 31, 32, and 46). Regeneration, seedling-sapling, and sparse stand acreage was subtracted from the total as these areas have little chance of sustaining large losses to SPB.

- Green tree:red tree ratio

  This ratio, based on the number of green infested trees to the number of red and fading infested trees, provides an indication of how rapidly a SPB spot is expanding at the time of ground check.

- Volume of timber currently infested and economic evaluation

  The volume of timber currently infested is calculated from the ground checked SPB spots. The currently infested volume is used in the Southern Pine Beetle Economic Evaluation Program (SPBEEP) to develop the economic benefit cost ratio, internal rate of return, targets for timber to be removed, and the volume of timber protected by control efforts. As the volume of timber currently infested with SPB increases, the economic benefits from a SPB suppression project also increase.

- Projected additional timber loss in each spot for the 30 day period following ground check

  A formula developed by Billings and Hynum (1980) was used to predict additional timber loss during the 30 day period following ground checks. This formula uses total basal area and number of trees infested at the initial visit to predict additional trees killed in a 30 day period. The number of spots showing additional timber loss and the size of this loss are used to provide an indication of whether SPB damage will continue. Even if a large number of SPB spots occur on a district they are relatively unimportant if additional timber losses are small.

- Entomological judgment

  Professional experience and field observations from the ground checked spots are used to interpret and supplement the technical data to reach a final decision.

RESULTS AND DISCUSSION

LITTLE LAKE CREEK AREA

The only bark beetle activity in the Little Lake Creek RARE II Proposed Wilderness Area was a 55 tree Ips calligraphus (Germar) infestation in which black turpentine beetles, Dendroctonus terebrans (Olivier), were attacking the base of some trees. The spot was in immature loblolly sawtimber with approximately 39 active trees and started in a tree recently struck by lightning. Normally, Ips engraver beetles pose little threat to healthy timber, restricting their activity to damaged trees. However, due to additional drought-induced stress, the beetles were able to overcome host resistance creating an unusually large multiple tree infestation (Connor and Wilkinson, in press).

FOUR NOTCH AREA

The aerial survey over the Four Notch Further Study Area revealed 14 multiple tree SPB spots. FPM and district personnel ground checked 9 of these spots and found 7 actively infested by SPB and 2 vacated. The data for the ground checked spots are summarized in table 1.

The spots ranged in size from 2-79 infested trees and the mean ratio of green infested trees:red infested trees was almost 4:1. There is a total of 4,650 acres of susceptible host type on the Four Notch Area with a mean of 3.9 SPB spots/1,000 acres of susceptible host type.

Trend

Of the 7 active SPB spots ground checked, 4 were predicted to have additional timber loss during the next 30 day period (table 1). The range in predicted spot growth was 5 to 56 trees.

Economic Analysis

The estimated volume of trees currently infested is 223 MBF. If a SPB suppression project were undertaken, it is estimated that 233 MBF would be removed and 258 MBF would be protected. For detailed information on the economic benefits with and without a project refer to Appendix I.

Hazard Rating

Eight of the 9 infestations rated as high or medium risk to SPB attack. Lorio found on the Kisatchie National Forest that the majority of large infestations occurred in loblolly pine stands that were immature or mature sawtimber, well stocked, and on good sites (90 or better site index). This holds true for the Four Notch Area as table 2 demonstrates. Spots occurring in high hazard stands have the greatest potential for timber loss and, when feasible, should be controlled first.

Table 1. Summary of ground check data for the Four Notch Further Study Area, Raven Ranger District, Sam Houston National Forest, August 1982.

Spot No.	Total No. Trees	No. Infested Trees			No. Vacated Trees			% Infested	Green:Red Ratio[a/]	Age	Additional Spot Growth Loss[b/]	Total Basal Area
		Total	Green	Red	Total	Green	Red					
1	20	5	1	4	15	0	15	25	0.25:1	60	0	100
2	3	3	2	1	0	0	0	100	2.00:1	55	0	90
3	96	79	64	15	17	1	16	82	4.27:1	72	56	130
4	30	0	0	0	30	0	30	0	-	75	0	120
5	22	2	1	1	20	0	20	9	1.00:1	65	0	130
6	14	13	13	0	1	0	1	93	13.00:1	68	5	140
7	16	0	0	0	16	0	16	0	-	55	0	130
8	146	79	65	14	67	0	67	54	4.64:1	50	42	100
9	36	28	21	7	8	0	8	78	3.00:1	85	19	150
TOTAL	383	209	167	42	174	1	173	-	-	-	122	-
MEAN	43	23	18	5	19	0	19	55	3.98:1	65	14	121

a/ Based on infested trees only.

b/ Additional number of trees lost over 30 days during summer months (Billings & Hynum, 1980).

Table 2. SPB hazard rating summary for infestation locations, Four Notch Further Study Area, Sam Houston National Forest, August 1982.

Spot No.	Total Basal Area	Pine Basal Area	Total Tree Height	Site Index	Diameter (in.)	Age	Predominant Pine Species	SPB Hazard Rating
1	100	100	100	90	15	60	Shortleaf	High
2	90	40	105	100	14	55	Loblolly	Low
3	130	100	90	80	11	72	Loblolly	High
4	120	100	95	80	16	75	Shortleaf	High
5	130	100	110	100	18	65	Loblolly	Medium
6	140	110	100	90	18	70	Loblolly	High
7	130	110	90	90	14	55	Loblolly	High
8	100	90	95	90	15	65	Loblolly	High
9	150	130	100	80	15	85	Shortleaf	High
MEAN	121	109	98	90	15	67	-	-

RECOMMENDATIONS

While the entire Raven RD does not have an epidemic level outbreak, the number of infestations has increased since the early summer. Large areas of contiguous old growth, high density pine sawtimber such as those found on the Little Lake Creek and Four Notch Areas are highly susceptible to bark beetle attack. If large infestations within these areas are not controlled, SPB populations could expand rapidly and threaten both privately owned and National Forest managed stands.

Although the Ips infestation in the Little Lake Creek Area is 55 trees with more than half of them infested, FPM recommends that this spot not be controlled. It is quite unusual for an Ips engraver beetle spot to have grown to this size and there still is a high probability that it will go inactive by the fall or winter. If it continues to remain active and kill additional trees into the spring, then it should be controlled by salvage. The cut-and-leave alternative is not effective for Ips control and use of insecticides is not recommended in a proposed wilderness area.

The SPB spots in the Four Notch Area pose a much greater threat to the surrounding area. Table 1 shows that spots numbered 3, 6, 8, and 9 will remain active after 30 days if no action is taken. These were very active and contained several trees that were freshly attacked. These infestations will provide centers for spot proliferation in the fall when beetles are more likely to disperse and initiate new spots. Therefore, FPM recommends that timber losses due to SPB infestations can be reduced by using either the cut-and-leave or salvage control techniques. The use of cut-and-leave would minimize the impact to the environment, but it can only be used during the summer months (May 1 - September 30) when emerging beetles will not disperse. Thus, the only control alternative that may be presently viable in the Further Study Area would be salvage. There is no reason to cut the inactive spots or small spots (>10 trees) as there is little chance of further timber loss. For a more detailed description of control alternatives for SPB refer to Appendix II.

The other SPB infestations within the Four Notch Area that were not ground checked at the time of the evaluation should be located by district personnel and checked for spot growth potential using the Texas Forest Service Circular 249 (Billings and Hynum 1980) and Southern Pine Beetle Fact Sheet No. 3 (USDA Forest Service 1979). This will aid RD personnel in determining whether or not to expect additional timber losses and help set spot control priorities. All spots greater than 10 trees and likely to increase in size should be controlled.

Southern Pine Beetle

Guide for Predicting Timber Losses from Expanding Spots in East Texas

by

R. F. Billings and B. G. Hynum

Circular 249 **March 1980**

TEXAS FOREST SERVICE
A Part of
The Texas A&M University System

Many southern pine beetle infestations (SPB spots) enlarge during warm months if no direct control is applied. Other spots are abandoned by emerging beetles soon after detection with little or no additional loss of trees. The extent of timber losses from spot expansion will depend on the initial size of the infestation and the density (basal area) of the stand. The following steps describe how to predict tree and dollar losses from spot spread over a 30 day period during summer months. This estimate is useful for making better control decisions.

1. Examine the spot to determine if trees with fresh SPB attacks (stage 1) are present. See USDA Agricultural Handbook 558 for details. If there are no fresh attacks, no additional spot spread is likely to occur and the spot will probably be inactive within 30 days.

2. If freshly-attacked trees are present, count or estimate the total number of active trees in the spot. Active trees include trees with fresh attacks (stage 1) as well as those with SPB larvae, pupae or new adults (stage 2).

3. Estimate the stand basal area (in ft^2/acre) at the active head(s) of the spot, using a 10 factor prism. (Stand basal area = basal area of pines + hardwoods.)

4. From Table 1 (on reverse side) determine the additional tree losses to be expected after 30 days. *This estimate does not include the trees already dead or currently infested with beetles.*

5. To estimate the dollar loss to be expected from spot expansion over the next 30 days, use the following formula:

Expected dollar loss = A x B x C

where:

A = additional trees killed from Table 1.
B = average volume per tree.
C = stumpage price per unit volume.

6. For a given spot, the value in Table 1 for "trees remaining active" is an estimate of the number of active trees to be expected at day 30. This value, when compared to number of active trees at day 0, indicates whether the level of beetle activity in the spot is likely to increase or decrease if no control is applied.

Example Of How To Figure Dollar Losses

Question: What are the tree and dollar losses to be expected after 30 days from a spot of 75 active trees in a uniform sawtimber stand of 150 ft^2/acre basal area if average volume/tree = 100 bd. ft and stumpage price = $250/MBF?

Answer: From Table 1, additional trees killed after 30 days = 62.

Additional dollar loss = (62 trees) x (100 bd. ft/tree) x ($0.25/bd. ft) = *$1550.*

In other words, if this spot is not controlled, the landowner can expect to loose 62 more trees in the next 30 days, valued at $1550. This loss is in addition to trees already infested or dead.

TABLE 1

Additional Timber Losses To Be Expected From Spot Growth Over 30 Days During Summer in East Texas[1]

Number of Active Trees At Day 0[2]		Total Stand Basal Area (ft^2/acre)			
		20-60	70-110	120-160	170-210
		Predicted Value at Day 30			
5	Additional trees killed[3]	0	0	0	0
	Trees remaining active[4]	≤ 1	≤ 1	≤ 1	≤ 1
10	Additional trees killed	0	0	2	5
	Trees remaining active	≤ 2	≤ 2	4	7
20	Additional trees killed	0	5	12	18
	Trees remaining active	≤ 4	9	16	22
30	Additional trees killed	2	12	21	30
	Trees remaining active	8	18	27	36
50	Additional trees killed	9	24	39	54
	Trees remaining active	18	33	48	63
75	Additional trees killed	16	39	62	84
	Trees remaining active	30	53	76	98
100	Additional trees killed	24	54	84	115
	Trees remaining active	43	73	103	134

[1]To be used for evaluating spots in East Texas during months of June-October only.

[2]Number of stage 1 + stage 2 trees present when spot growth prediction is made.

[3]Predictions for "additional trees killed" derived from Texas Forest Service spot growth model (based on 1975 data):

$$ATK = [(0.000202\ IAT \times TBA) - 0.2211] \times 30$$

where ATK = number of additional trees killed by day 30
IAT = number of active trees at day 0
TBA = total basal area in ft^2/acre

[4]Predictions for "trees remaining active" (TRA) based on SPB developmental rate of 37 days and formula:

$$TRA = ATK + \frac{7}{37}(IAT)$$

United States Department of Agriculture
Forest Service

FOREST INSECT AND DISEASE MANAGEMENT

Technology Update

Southeastern Area, State and Private Forestry, 1720 Peachtree Road, N.W., Atlanta, Ga. 30309

Southern Pine Beetle Fact Sheet
Number 3

SETTING CONTROL PRIORITIES

FOR THE SOUTHERN PINE BEETLE*

All southern pine beetle spots (groups of infested trees) do not have the same control priority. The following guidelines should help you set priorities for controlling individual spots.

A. Classify the infested trees according to the stage of attack shown below.

Symptom	Stage 1 Fresh attacks	Stage 2 Developing broods	Stage 3 Vacated trees
Foliage	Green	Green, trees with larvae; fade to yellow before new generation.	Red, needles falling.
Pitch tubes	Soft white, light pink,	White, hardened.	Hard, yellow, crumbles easily.
Checkered beetles	Adults crawl on the bark.	Larvae in SPB galleries; pink or red; 1/2 inch long.	Larvae and pupae are purple; occur in pockets in the outer bark.
Bark	Tight, hard to remove.	Loose, peels easily.	Very loose, easily removed.
Color of wood surface	White, except close to new adult galleries.	Light brown with blue or black sections.	Dark brown to black, may have sawyer galleries.
Exit holes	----	May appear where parent beetles left the tree.	Numerous
Ambrosia beetle dust	---- ----	White, begins to appear around the base of trees.	Abundant at the base of trees.

*Compiled from a handbook of the Texas Forest Service. It will be published this fall by the USDA's Expanded Southern Pine Beetle Research and Applications Program.

B. Collect spot expansion data:

1. Walk completely around the spot and look for stage 1 trees, which indicate the area of most recent beetle activity. Areas with stage 1 pines are called "Active heads." Check to see if the spot is expanding in more than one direction. Large spots can have more than one active head.

2. Determine the number of stage 1 and 2 trees. For large spots that have more than 50 trees, it is not necessary to examine each tree. Just walk the boundaries and estimate the number of these trees in the spot.

3. From a location about 20 feet (6 m) in front of the active head(s), determine the pine basal area (a measure of stand density) in square feet per acre. A 10-factor prism is useful for this purpose.

4. Note whether most trees in the spot are pulpwood (less than 9 inches in diameter) (23 cm) or sawtimber size (more than 9 inches in diameter).

5. If only stage 3 trees are present, control is not necessary.

6. Determine the control priority for the spot, using the guide on the next page (item C).

C. Guide to southern pine beetle control priorities (May through October):

Key to spot growth	Your spot's classification	risk-rating points
A. Stage 1 trees	absent	0
	present	30
B. Stage 1 and 2 trees	1 to 10	0
	11 to 20	10
	21 to 50	20
	more than 50	40
C. Pine basal area (ft^2/a) or stand density at active head or heads	less than 80 (low density)	0
	80 to 120 (medium density)	10
	more than 120 (high density)	20
D. Stand class by average d.b.h. (in inches)	pulpwood (9 inches or less)	0
	sawtimber (more than 9 inches)	10

	Buffer strip width (feet)
If total is: 70 to 100.....control priority is: High	40 to 100
If total is: 40 to 60.....control priority is: Medium	10 to 40
If total is: 0 to 30.....control priority is: Low	10 to 40

APPENDIX I

Table 3. Southern pine beetle economic evaluation for the Raven RD at 4% discount rate.

WITHOUT A PROJECT

AGE	HARV OBJ.	VOLUME LOST (MBF)	SPOT GROWTH RATE	VOLUME THREAT (MBF)	GROWTH RATE (%)	AGE AT HARV.	VOLUME AT HARVEST (MBF)	PRICE AT HARV.	VALUE AT HARVEST	PRESENT VALUE
60	S/F	117	2.21	258	.5	70	272	$ 130	$ 35418	$ 23007
TOTAL		117		258			272		$ 35418	$ 23007

VALUE OF THE VOLUME NOT SALVAGED (LOST) $ 5249

TOTAL VALUE LOST $ 28256

WITH A PROJECT

AGE	HARV OBJ.	VOLUME LOST (MBF)	SPOT GROWTH RATE	VOLUME THREAT (MBF)	GROWTH RATE (%)	AGE AT HARV.	VOLUME AT HARVEST (MBF)	PRICE AT HARV.	VALUE AT HARVEST	PRESENT VALUE
60	S/F	0	2.21	0	.5	70	0	$ 130	$ 0	$ 0
TOTAL		0		0			0		$ 0	$ 0

VALUE OF THE VOLUME NOT SALVAGED (LOST) $ 0

TOTAL VALUE LOST $ 0

PROJECT BENEFITS:	28256
TOTAL PROJECT COST:	4335
NET PRESENT VALUE:	23921
BENEFIT COST RATIO:	6.52
INTERNAL RATE OF RETURN:	> 400%
COMPOSITE RATE OF RETURN:	23.33%
TARGETS	
VOLUME REMOVED:	233
VOLUME PROTECTED:	258

Table 4. Southern pine beetle economic evaluation for the Raven RD at 7.12% discount value.

WITHOUT A PROJECT

AGE	HARV OBJ.	VOLUME LOST (MBF)	SPOT GROWTH RATE	VOLUME THREAT (MBF)	GROWTH RATE (%)	AGE AT HARV.	VOLUME AT HARVEST (MBF)	PRICE AT HARV.	VALUE AT HARVEST	PRESENT VALUE
60	S/F	117	2.21	258	.5	70	272	$ 130	$ 35418	$ 16621
TOTAL		117		258			272		$ 35418	$ 16621

VALUE OF THE VOLUME NOT SALVAGED (LOST) $ 5249

TOTAL VALUE LOST $ 21870

WITH A PROJECT

AGE	HARV OBJ.	VOLUME LOST (MBF)	SPOT GROWTH RATE	VOLUME THREAT (MBF)	GROWTH RATE (%)	AGE AT HARV.	VOLUME AT HARVEST (MBF)	PRICE AT HARV.	VALUE AT HARVEST	PRESENT VALUE
60	S/F	0	2.21	0	.5	70	0	$ 130	$ 0	$ 0
TOTAL		0		0			0		$ 0	$ 0

VALUE OF THE VOLUME NOT SALVAGED (LOST) $ 0

TOTAL VALUE LOST $ 0

PROJECT BENEFITS:	21870
TOTAL PROJECT COST:	4335
NET PRESENT VALUE:	17535
BENEFIT COST RATIO:	5.04
INTERNAL RATE OF RETURN:	> 400%
COMPOSITE RATE OF RETURN:	24.09%
TARGETS	
VOLUME REMOVED:	233
VOLUME PROTECTED:	258

Appendix II

ALTERNATIVES FOR SOUTHERN PINE BEETLE CONTROL

Five alternatives are recommended for southern pine beetle control. The following discussion briefly outlines these alternatives (Swain & Remion 1980). For a more detailed description on conducting control procedures in a southern pine beetle suppression project refer to the Project Control Plan or to the southern pine beetle handbook series (Agric. Handb. Nos. 558, 560, 575, 576).

Alternative 1. Remove trees through salvage.

Salvage is the method most often used for stopping the growth of existing spots. This strategy involves removing a buffer strip of noninfested trees, all green infested and red infested trees, and if desired, the trees already killed by the beetles. Costs associated with removing uninfested trees are not charged to specifically designated SPB Project Control Funds since removing uninfested material is not needed for successful control even though it may be operationally desirable. The buffer strip should surround the recently attacked trees. It should be 40 to 70 feet wide for most active spots, while a 100-ft strip (and occasionally larger) may be needed for large, rapidly expanding spots. As a rule, the width of the buffer should not exceed the average height of the trees in the spot. The SPB spot should be carefully surveyed and all trees to be removed should be marked.

To implement this alternative the buffer strip should be cut first. All infested trees should then be cut. Vacated trees are cut last and are removed only for utilization purposes. All trees should be felled toward the center of the spot. The reason for this is to keep infested trees as far away from noninfested trees as possible. This reduces the chance of beetles killing additional trees.

Alternative 2. Piling and burning.

Unmerchantable or inaccessible southern pine beetle infestations can be suppressed by cutting, piling, and thoroughly charring the bark of infested trees. The entire bark surface must be thoroughly charred to insure effective control. The order of priority for cutting, piling, and burning infested trees, particularly in large spots, is the same for Alternative 1. Cutting a buffer strip is not recommended. To reduce the possibility of "breakouts", every effort should be made to locate and treat all green infested trees during the piling and burning operation.

Alternative 3. Cut-and-leave infested trees.

This is accomplished by felling a buffer strip and all infested trees toward the center of the spot. The purpose is to stop spot growth. Use of this method causes beetles to disperse at a time of year when this behavior is unnatural. This results in a reduction of mass attacked trees and spot growth ceases. Cut-and-leave should only be used in the summer (May 1 - September 30), since these are the only months beetles are not dispersing. It should only be used on small spots, normally 50 infested trees or less.

If spots are greater than 50 infested trees cut-and-leave could be used, but these areas should be monitored biweekly for at least 2 months to insure that a breakout does not occur.

Alternative 4. Chemically treat infested trees.

In this method, infested trees are felled toward the center of the spot, cut into workable lengths, and sprayed with lindane or Dursban® 4E. The purpose of this method is to kill the beetle population. To be effective, all bark surfaces must be sprayed. This involves turning the logs which becomes more difficult as tree size increases.

Forest Pest Management, Alexandria Field Office, Pineville, LA, should be contacted prior to the extensive use of chemical control for an update on latest restrictions or application procedures.

Alternative 5. No action.

SPB populations increase periodically. When they increase, large numbers of susceptible pines are killed. This may occur over one to several years, and then the SPB populations collapse and the corresponding pine mortality subsides. This will continue periodically until transition to a climax forest occurs.

Some cutting will have to be done even if this alternative is selected. Dead trees will begin to decay and eventually fall down. Any dead trees along roadsides or in high-use areas should be felled.

PRECAUTIONARY STATEMENT

Pesticides used improperly can be injurious to man, animals, and plants. Follow the directions and heed all precautions on the labels.

Store pesticides in their original containers under lock and key out of reach of children and animals, and away from food and feed.

Apply pesticides so that they do not endanger humans, livestock, crops, beneficial insects, fish and wildlife. Do not apply pesticides when there is danger of drift, when honey bees or other pollinating insects are visiting plants, or in ways that may contaminate water or leave illegal residues.

Avoid prolonged inhalation of pesticide sprays or dusts; wear appropriate protective clothing.

If your hands become contaminated with a pesticide, wash them immediately with soap and water. In case a pesticide is swallowed or gets in the eyes, follow the first aid treatment given on the label and get prompt medical attention. If a pesticide is spilled on your skin or clothing, remove the clothing immediately and wash skin thoroughly. After handling or spraying pesticides, do not eat or drink until you have washed with soap and water.

Do not clean spray equipment or dump excess spray material near ponds, streams, or wells. Because it is difficult to remove all traces of herbicide from equipment, do not use the same equipment for insecticides or fungicides that you used for herbicides.

Dispose of empty pesticide containers promptly. Have them buried at a sanitary landfill dump, or crush and bury them in a level, isolated place.

NOTE: Some states have restrictions on the use of certain pesticides. Check your state and local regulations. Also, because registrations of pesticides are under constant review by the U.S. Environmental Protection Agency, consult your county agent, state extension specialist or FPM to be sure it is still registered for the intended use. For further information or assistance, contact Forest Pest Management, Alexandria Field Office, Pineville, La., 71360, (Telephone: FTS 497-7280, or Commercial 318/473-7280).

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